UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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REGIONAL ADMINISTRATOR

May 3, 2010

Shirley J. Olinger, Manager
U.S. Department of Energy
Office of River Protection
P.O. Box 550
Richland, Washington 99352

Re: Comments on the Draft Tank Closure and Waste Management EIS for the Hanford Site, Richland, WA
EPA Region 10 Project Number: 06-004-DOE

Dear Ms. Olinger:

The U.S. Environmental Protection Agency (EPA) has reviewed the Department of Energy (DOE) Draft Environmental Impact Statement (DEIS) for the proposed **Tank Closure and Waste Management (TC&WM) Project** (CEQ#20090362) at the Hanford Site in Benton County, Washington State. This review is in accordance with our authorities under Section 102(2)(C) of the National Environmental Policy Act (NEPA), 42 U.S.C. Section 4332(2)(C) and Section 309 of the Clean Air Act, 42 U.S.C. Section 7609. DOE has gathered valuable information into this DEIS that will inform a series of decisions to be made under DOE Orders and through permits under the Washington State Department of Ecology's Dangerous Waste Regulations, a delegated Resource Conservation and Recovery Act (RCRA) program.

The DEIS analyzes potential environmental impacts associated with three sets of proposed actions: *a) Tank Closure* that would store, retrieve, treat, and dispose of nearly 53 million gallons of radioactive and chemical waste from 149 single-shell tanks (SSTs) and 28 double-shell tanks (DSTs), and closure of the SST system; *b) Decommissioning of the Fast Flux Test Facility* (FFTF); and *c) Waste Management* that would include disposal of Hanford's and potentially other DOE sites' low-level and mixed low-level wastes. Preferred Alternatives have been selected for the FFTF decommissioning and Waste Management actions (Alternatives 2 and 2, respectively). Of 11 potential Tank Closure actions, Alternatives 2A, 2B, 3A, 3B, 3C, 4, and 5 would capture DOE's preferred options for tank waste retrieval, treatment, and closure of the SST system. The DEIS does not identify a specific Tank Closure Alternative.

EPA's primary interest is a clear indication that combined cleanup actions at Hanford will result in conditions that are protective of human health and the environment. The DEIS should show how preferred alternatives fit firmly into that trajectory. The document as written does not clearly show the mechanisms and requirements that will assure that proposed actions will achieve a protective outcome. The analyses must be effectively presented to make closure decisions, yet the document does not describe closure requirements that will be necessary in order to obtain permits related to these decisions.

The DEIS shows that all tank closure alternatives would leave contaminants such as Technetium-99 (Tc-99) and Iodine 129 (I-129) in the vadose zone soils leading to groundwater contamination well above drinking water standards for thousands of years at the core zone boundary. For example, under Alternative 2B, according to analyses in this DEIS, concentrations of Tc-99 in groundwater at the core zone boundary would exceed standards by factors of 2 – 100 for about the next 3,000 years, over an area up to 5.3 square kilometers. The DEIS also shows that standards for Tc-99, I-129, uranium isotopes, total uranium, chromium and nitrate would be exceeded at the core zone boundary for all alternatives. We recognize that contaminants in the vadose zone have come from multiple activities at the site and that multiple cleanup programs are responsible for addressing the contamination. However, we believe that significant, additional mitigation is necessary for the actions that are informed by this DEIS. Clean closure techniques may be warranted to meet permit requirements and/or to prevent further contamination of the deep vadose zone and groundwater. While we understand that technologies are not yet fully developed, commitments should be made to fully develop viable, effective methods to remove contaminants from the vadose zone for use within the cleanup timeframe and as part of actions proposed in this DEIS.

Under the Preferred Waste Management Alternative, there would also be Tc-99 and I-129 releases to the groundwater from the Integrated Disposal Facility (IDF) in 200 Area East, with concentrations 25 and 15 times higher than the standards for Tc-99 and I-129 at the IDF, core zone boundary, and Columbia River, respectively (Tables 5-77 through 88). We also have concerns about stability of radionuclides in secondary waste that will be disposed in landfills and assumptions about the tribal exposure used in radiological risk assessments.

The DEIS analyses do not take credit for ongoing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) actions, nor do the analyses acknowledge that future CERCLA actions are intended to remediate contaminants in a manner protective of human health and the environment. Descriptions and analyses in the EIS should account for CERCLA remediation actions where applicable in order to fully account for present and future resource conditions.

We are concerned about the models as presented in the DEIS. The presentation of information was not easy to follow, critical assumptions were presented with very little justification, and too little information regarding specifics of most model applications was provided. In addition, we have concerns regarding the way uncertainties in many aspects of the flow and transport modeling were recognized and analyzed. Because there was a limited attempt to aggregate the uncertainties resulting from all of the modeling components, the conclusion in the DEIS was that there is *"a lot"* of uncertainty in the simulated groundwater contamination results. Thus, we cannot currently ascertain with a high degree of confidence the modeling predictions of impacts. Also, we cannot know how omitted CERCLA cleanup data would influence the extent of predicted impacts in the DEIS. We believe that additional analyses are necessary to characterize the proposed actions' impacts correctly.

We acknowledge progress made in addressing some of our concerns at a meeting held among EPA, Department of Energy, and State of Washington Department of Ecology on April

5^{th} and 6^{th}, 2010 in Richland, WA. At that meeting, all agencies agreed that the TC&WM EIS would include the following:

- Analysis of a range of secondary waste performance at IDF. This will include how that range would perform when combined with primary waste forms.
- A write up related to the goals of the CERCLA cleanup program, annotation of graphics in the cumulative sensitivity analysis, and support for discussion in cumulative impacts.
- Analysis of a certain set of sites which have resulted in contamination in the vadose zone, assuming, in a sensitivity analysis, a certain level of cleanup which could be achieved and projection of the results.
- Sensitivity analyses that include both off-site waste mitigation and off-site waste not coming to the site (done for IDF East at a 3.5 mm background rate).

Because of serious concerns about potential impacts to groundwater that will require substantial changes to the suite of preferred alternatives, concerns about stability of radionuclides in secondary waste, and concerns about some of the modeling and presentation of the results, we have assigned an EO-2 (Environmental Objections – Insufficient Information) rating to the DEIS. A detailed discussion of our concerns is included in the enclosed comments (Enclosure 1).

We recognize that significant progress has been made and look forward to continuing collaboration as work on this EIS continues.

Sincerely,

Richard B. Parkin

Richard B. Parkin
Acting Director
Office of Ecosystems, Tribal, and Public Affairs

Enclosures

1. EPA Detailed Comments
2. EPA criteria for rating draft EISs

EPA Detailed Comments on the Draft Tank Closure and Waste Management EIS for the Hanford Site, Richland, WA

Contaminants in the Vadose Zone

Radionuclide and chemical contamination levels in the vadose zone are currently very high and would remain higher than the standards for Constituents of Potential Concern (COPCs). The DEIS shows that all tank closure alternatives would leave contaminants such as Tc-99 and I-129 in the vadose zone soils leading to groundwater contamination well above drinking water standards for thousands of years at the core zone boundary. For example, under Alternative 2B, concentrations of Tc-99 in groundwater at the core zone boundary would exceed standards by factors of 2 – 100 for about the next 3,000 years, over an area up to 5.3 square kilometers. The DEIS also shows that standards for Tc-99, I-129, uranium isotopes, total uranium, chromium and nitrate would be exceeded at the core zone boundary for all alternatives. Under the Preferred Waste Management Alternative, there would also be additional Tc-99 and I-129 releases to the vadose zone in concentrations that would exceed standards for each of these two COPCs by as much as 15 and 25 times (Tables 5-77 through 88). We believe that the EIS should address vadose zone contamination and structure tank closure decisions such that actions will be taken to reduce existing contamination in the vadose zone and prevent worsening contamination problems in groundwater (Table 2-17) that would require more cleanup activity.

Contamination in the vadose zone would be mostly due to past leaks from multiple sources (tanks, cribs, trenches and ditches), and continued leakage from these areas, including tank leaks that may occur during waste removal, and leaks from residual waste remaining in the tanks as the tanks deteriorate over time. The DEIS is not clear about vadose contamination levels present or expected from each source, nor about requirements that must be met for tank closure.

Section 2.2.2.4.2 discusses clean closure. Unlike RCRA, clean closure is defined in the DEIS as removal of the SST, waste receiving facilities, ancillary equipment, and soil within the tank farms to a depth 10 feet below the bottom of the tanks. The 10-foot depth is an estimate of the depth necessary to capture leakage from the tanks during the retrieval process. Clean closure, as defined in the DEIS, may also include deep soil excavation of 65 to 225 feet below the land surface to remediate contaminant plumes (p. S-95). We acknowledge the technical challenges that deep removal would entail. However, we believe that the DEIS should clearly state that drinking water Maximum Contaminant Levels (MCLs) are the overall target for cleanup. Further, the EIS should clearly describe tank closure requirements that will cover responsibilities under the RCRA actions.

Section S.2.1.2 does state that options include retrieving waste to the maximum extent that is both technically practical and required to support closure of the SST system. Chapter 8 also discusses potentially applicable laws, regulations, and other requirements. However, the DEIS does not clearly document meeting the limits of technical practicability. It is not clear how the 90%, 99%, and 99.9% retrieval levels selected for the various SST retrieval/closure options relate to the closure performance standards of WAC 173-303-640(8)(a) applicable to dangerous/mixed waste tank systems, which require tank systems to close by removal or decontamination ("clean" closure). Further, it is not clear how the retrieval levels, or the corresponding analysis of them, relate to the provisions of WAC 173-303-640(8)(b), which requires closure of tank systems as a landfill if it is not practicable to remove or decontaminate contaminated soils (and presumably other tank system components) associated with tank systems. EPA notes that the choice between clean closure and landfill closure under RCRA is not discretionary, but is explicitly contingent on a demonstration by the owner or operator that it is not practical to remove or decontaminate soils. The DEIS, with critical regulatory input from Ecology as the lead decision-maker, should ensure that alternatives and analyses of them explicitly address these points.

Recommendation:

- *The final EIS should consolidate and briefly discuss requirements that pertain to tank closure actions, especially for removal of contaminants from soils, and measures that will be taken to meet the requirements. That information could clarify (1) the degree of waste retrieval from tanks that should be required, given the amount of radionuclides in the immediately surrounding environment, and (2) the application of removal to the "maximum extent practical" to leaked radionuclides.*
- *The final EIS should discuss in sufficient detail ongoing CERCLA remediation actions, their effectiveness in removing contamination, and future cleanup goals of the program to protect human health and the environment.*
- *The final EIS should include a Preferred Alternative for tank closure that would prevent additional contaminant releases to surface soils and the vadose zone in the project area and/or develop effective technologies to remove or immobilize the appropriate amount of existing contamination beneath tank farms.*

Most of the vadose zone in the project area (200-, 400-, and Borrow-C Areas) is made up of unconsolidated sands and gravels of the Hanford formation, which are highly permeable, with depths ranging from 164-328 ft. Groundwater generally flows eastward across the site from recharge areas and discharges to the Columbia River. The Yakima River is also considered a source of recharge. Over the years and with wastewater disposals, the water table has risen about 30 ft. - 89 ft. within the project site. Some contaminants move with groundwater (e.g., tritium and nitrate), while movement of the others (e.g., strontium and cesium) is slower due to their interaction with minerals within the hydrologic system. In this "suprabasalt" aquifer system of the project site, hydraulic head data have indicated that groundwater flows toward the Columbia River, with travel time ranging from 10-50 years. This time could be shortened, however, by other proposed projects and natural events (floods, climate change, and other events) with the potential to affect groundwater flow speeds.

The EIS assumes that most of the 200 Area waste sites are capped in place (landfill closure) (Tables in Appendix S). The EIS, as summarized on page 6-169, shows that such a general remedial strategy would not be protective of groundwater. The first threshold criterion for all CERCLA remedial actions is to be protective of human health and the environment. The second threshold criterion is to comply with (or waive) applicable or relevant and appropriate requirements. One such requirement would be groundwater drinking water standards. The numerous Hanford 100 Area and 300 Area records of decision and the one 200 Area record of decision for groundwater have been at least as stringent as the drinking water standard. Therefore, it is not appropriate for the EIS to assume that the remedial action end state for the 200 Area waste sites is landfill closure which is not protective of groundwater. The EPA understands that these waste site cleanup actions are outside the scope of the EIS. However, this non-EIS cleanup scope is included in the EIS cumulative analysis and the EIS makes comparative conclusions such as the following: "Estimated impacts from groundwater releases that are not associated with the *TC & WM EIS* alternatives, e.g., past leaks, are greater than estimated impacts from releases associated with the *TC & WM EIS* alternatives" (page 6-169). This approach under-represents the relative groundwater consequences of DOE's alternatives.

Recommendation:

- *EPA recommends that DOE change the assumed end state for the CERCLA vadose zone and groundwater cleanup actions such that groundwater contamination meets Washington State Model Toxics Control Act (MTCA) and drinking water standards throughout the 200 Area, plus surface water quality standards immediately adjacent to the Columbia River, as this is the logical extrapolation from all existing CERCLA Record Of Decisions (RODs).*

Table D-37, which is for tank closure alternative 2B (in-place closure of tanks, cribs, and trenches), states, "For analysis purposes, waste inventories from tank waste retrieval leaks and ancillary equipment were assumed to be treated in the Waste Treatment Plant." However, this appears to be a faulty assumption, as under this alternative, those wastes would be left in place, not retrieved and sent to the waste treatment plant. Leaks during retrieval contribute additional waste inventory that is available for leaching to the soil beneath tanks. Comparing Table D-31 (leaks during retrieval) to Table D-27 (historical leaks) shows that retrieval leaks for most tanks will contribute about as much new waste to the underlying soil as historical leaks. To assume these leaks will be treated via the vitrification plant when, in fact, most alternatives (including DOE's preferred alternatives) leave the leaked waste in the soil, likely significantly underestimates future groundwater impacts. This needs clarification. There are other tables in section D with this same footnote, which is inconsistent with the alternative.

The DEIS indicates DOE's preferred percent tank waste retrieval is 99%, which would leave 1% of tank waste in place. We believe that level of waste removal from the tanks is an important step forward in dealing with tank waste, especially in leak-prone SSTs that are now twice their original design lifecycle (10-20 years). The remaining waste, however, would more likely be composed of radionuclides of concern, particularly phosphates that contain strontium-90 and transuranic isotopes. Tank waste at Hanford is heterogeneous due to use of different separation processes (p. S-96). Heels therefore left in the tanks may have to be characterized to demonstrate that the waste has been adequately removed from tanks and that the residues can be left in tanks, with minimal risk. DOE Order 435.1 requires that residues remaining in the tank "have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical." If characterized, then it would be easier for DOE to identify an appropriate immobilization technology tailored to the type of chemical and concentration in residual waste.

Recommendation:

- *EPA recommends that the final EIS include a discussion describing how vadose zone contamination resulting from waste remaining after tank waste retrieval will be remediated, additional contamination from such waste (heels) will be prevented, and plans for long-term stewardship of the site to prevent future contamination.*

Modeling

Our review of modeling is based on information presented in Appendices L, N, and O. We found that the document was very difficult to review in a meaningful way. Apparently, there is a body of supporting documentation in the public record, which is not referenced in the EIS or made available to reviewers. We recommend that this material be referenced in the final EIS and included on the web site. The presentation of information was not easy to follow, critical assumptions were presented with very little justification, and too little information regarding specifics of most model applications was provided. In addition, we have concerns regarding the way uncertainties in many aspects of the flow and transport modeling were recognized and analyzed. Because there was a limited attempt to aggregate the uncertainties resulting from all of the modeling components, the conclusion in the DEIS was that there is *"a lot"* of uncertainty in the simulated groundwater contamination results. Based on conclusions in summary results, we are particularly concerned with:

a) The conclusion that "*The bulk of the cumulative human health impacts would result from releases of contaminants attributable to past leaks and releases independent of the alternatives evaluated in this TC & WM EIS*" is not supported by the modeling work because past, current, and planned future CERCLA remediation activities were not considered. After our meeting with DOE and Ecology, EPA expects to see more clarifying information in the final EIS.

b) Data in Table S-10 show cumulative maximum peak concentrations in groundwater. With the exception of four values that have occurrence dates in the future, this information may be irrelevant to future decision making. The entire period during which COPCs concentrations exceeded the benchmark concentrations at the Columbia River near shore should be shown on the table.

It is, however, likely that the modeling effort as a whole provides results that are useful for comparing the impacts from the different alternatives against each other, but there is little certainty in the actual predicted outcome for any alternative (peak concentrations, arrival times, cumulative risk, etc.)

Groundwater Flow Field Development

In general, we agree that the *Groundwater Flow Field Development* (Appendix L) processes are reasonable and are the best documented approaches to dealing with the subject. We believe the hydrogeologic framework used is consistent with past work at the site, the flow directions look to be reasonable, and the water-level predictive errors were minimized. Our concerns with the process relate to boundary conditions, parameter estimation and Monte Carlo runs, and other issues as indicated below. Despite these issues, it looks like the base case and alternative case models are generally reasonable and perform in the near-term as desired. However, the subjective elements in their construction and calibration add a substantial degree of uncertainty into their utility as predictive models, particularly when the predictions are for the next 10,000 years.

c) *Boundary conditions*

i) Groundwater inflow to the model domain from the west was found by the authors to be a very important parameter, but the manual calibration of that parameter appears to have been done prior to the final calibration (Monte Carlo Optimization). The assumption of non-varying recharge along the western boundary is poorly justified. It is likely that irrigated agriculture on the western flanks of Rattlesnake Mountain and other areas bordering and upgradient of the site will increase over the coming decades (as it has over the past decades), thus changing the influx over time. The reader should (at a minimum) be referred to Appendix V where the analysis of potential effects of the proposed Black Rock reservoir are presented; that analysis serves as a proxy for increased groundwater inflow to the model domain from the west due to expansion of irrigated lands.

ii) Assuming a non-varying recharge of 3.5 mm/year for the next 10,000 years subjectively eliminates a potentially large source of long-term uncertainty in the model. Additional justification of this assumption is warranted.

iii) Justification is needed for the assumption that there is negligible water exchange between the unconsolidated sediments and the underlying basalts. This no-exchange assumption is perhaps reasonable for predictive simulations over a few decades, but the implications for that assumption over the 10,000-year predictive window are never mentioned. Because of the no-exchange assumption, on-site effects due to changes in such things as irrigated agriculture may not be realistically simulated over the long term. The Columbia River Basalt Group of the Columbia Plateau Regional Aquifer System is one of the nation's principal aquifers and is a significant source of groundwater for irrigation, domestic, and other uses. A default assumption would therefore be that there is water exchange with the basalts. The EIS should be updated to reflect existence of water exchange between the project area basalts.

iv) The DEIS was not clear about whether or not groundwater extraction from past, current, and planned future remediation activities at the site were included in the model. Given that the current 90% design for the pump and treat system for the 200-ZP-1 groundwater operable unit is planned to pump at a rate nearly equivalent to the natural recharge rate over the area, the system will have a substantial impact on the flow field over the next few decades. The system will have an even greater impact on the fate of existing and near-future groundwater contaminants. For the 200 West Area in particular, a substantial amount of carbon tetrachloride has been removed from groundwater to date, and the 90% design for the greatly expanded pump and treat system for the 200-ZP-1 GW operable unit will remove much more, as well as uranium and Tc-99. Because remediation systems are not included in the model, the simulation results that are influenced by contaminants that are already in groundwater (or will drain to groundwater in the next few decades) are not realistic. The final EIS should discuss impacts on the fate of existing and near-future groundwater contaminants, and clarify how past, current, and planned remediation impacts were considered in modeling groundwater flow through established boundaries.

d) *Parameter estimation and Monte Carlo runs*

i) The parameter estimation of the flow model would have been more informative if the estimation included contaminant concentrations predicted by a transport model, and/or the flux into the groundwater system from natural recharge, mountain-front recharge, and water exchange with basalts were allowed to vary within certain ranges. A flow-field calibration that only considers water level data will be highly uncertain. Are there sections of other appendices where the flow model results are verified by transport simulation results?

ii) Overall, the calibration approach was a mix of quantitative and subjectively prescribed conditions. It is unclear why the Monte Carlo analysis was done because 1) it doesn't look like the uncertainty analysis was carried through to the transport modeling and risk assessment, so quantified uncertainty in the flow field is only marginally relevant, and 2) selection of the Base Case relied on the prescription that "The Technical Guidance Document …directed that the Base Case flow model would flow predominantly eastward from the 200 Areas of Hanford," and the alternate case relied on the prescription that "The majority of the particles released to the water table within the core zone boundary (200 Area Central Plateau of Hanford) move to the north through Gable Gap rather than to the east toward the Columbia River." Following those prescriptions essentially negated any objective parameter estimation. And although the base case and alternate case hydraulic conductivity parameter values are different, they are essentially equivalent for the predominant material types at the site.

iii)The assumption of invariant hydraulic characteristics for each "material type" (unit) is unnecessary and unlikely. Results showed how specifying different characteristics for the "highly conductive Hanford gravel" improved the water level matching. Were the hydraulic parameter values for other material types allowed to vary in particular zones? With parameter estimation, it is reasonable to let characteristics for a unit vary within a certain range.

e) *Other specific Comments on Appendix L:*

(1) Page L-3, Section L.2 - "Relatively impermeable" has no hydrogeologic meaning. The basalt can be assumed impermeable, but in reality, it just has relatively low permeability when compared to the overlying sediments.

(2) Page L-6, Section L.3.1—A list of all MODFLOW packages used should be included. Additional discussion on selection of some packages is warranted. For example, it seems as though the HUF rather than the LPF package was used; why? There are implications for using either package that should be discussed.

(3) Figure L-1—The model domain is not shown in the figure. Use a topographic or similar map that shows Rattlesnake Ridge and the western boundary of the domain.

(4) Page L-9, final paragraph—The statement "This finding justifies a uniform 200- by 200-meter (656- by 656-foot) grid across the entire model domain" is not true.

The simulation of many surface features, such as source areas and recharge basins, also depends on cell size. The 200x200 cells are likely not a problem, but the issue of the TOB in Gable Gap is just one consideration. The final EIS should expand this discussion to address the other factors considered in selecting cell size. Additional information on cell size in groundwater modeling can be found online at http://pubs.usgs.gov/sir/2004/5038/ (see p. 5-10).

(5) Page L-14, Section L.4.2.4—Are the stated "natural area" recharge rates applied throughout the entire 10,000-year period?

(6) *Page L-24*:

(a) It is stated that "If more than one geologic layer is contained within one MODFLOW cell, the cell is assigned the properties of the hydrostratigraphic type with the largest total thickness over the range of elevations represented by the MODFLOW layer." Why was this done rather than using effective parameter values for cells with heterogeneous sediments? If you want to have uniform materials in cells, perhaps the LPF package approach would be a better choice.

(b) Page L-24, final bullet: Were there any stratigraphic data from borehole logs to support this high conductivity channel? Given that flow through the gap was a primary modeling question, this assumption is more than "fine-tuning" and would benefit from additional justification.

(c) Page L-26, Section L.5.2—The preconditioning period was really 503 years long as described in L.5.4.

(7) Page L-31, L.7.2.2—What was the resulting flux of water into the model domain? Was it large relative to natural or anthropogenic recharge?

(8) Page L-37; Section L.9—It is unclear why the Monte Carlo analysis was needed. PEST gave reasonable parameter values. It doesn't look like the uncertainty analysis was carried through to the transport modeling and rick assessment, so why focus on it for the flow field?

(9) Page L-72 through L-81, Sections L.10.1.3.1 and 2—The tritium plume particle tracking exercise was non-conclusive, and as stated, many of the runs could be considered acceptable. The Central Plateau Pathline Analysis was based on the subjective criterion that flow should predominantly be to the east. Neither of those exercises lends objective credibility to selecting the preferred Base Case over the other runs. These same comments apply to the path line analyses for the alternate case.

Vadose Zone Flow and Transport

A flow diagram illustrating the procedure for selection of values of vadose zone hydraulic parameters is given in Fig. N-1. The first step in this process is "determine hydraulic parameters for 16 soil types by matching predicted moisture profiles to moisture profiles observed in undisturbed bore holes." An example fit to measured moisture content profiles is given in Fig. N-2. This is an extremely insensitive method for determining hydraulic parameters. A "good fit" to a moisture content profile such as that shown in Fig. N-2 can be obtained for virtually any set of soil hydraulic parameters by adjusting the assumed recharge rate, which is generally unknown. If the recharge rate is assumed to be known and constant, then what a moisture content profile such as is shown in Fig. N-2 tells you is the moisture content at which the unsaturated hydraulic conductivity is equal to the assumed recharge flux per unit area – and that is all. Van Genuchten parameters cannot be deduced from this information. This proposed method indicates a lack of understanding of basic vadose zone physics. The rest of the flow diagram" (Fig. N-1) appears to make little sense and will not yield reasonable estimates.

Regarding the *Groundwater Transport Analysis*, the particle-tracking approach adopted for the transport simulations is potentially useful if used correctly and carefully. However, there is little information on the specifics of the application to evaluate the quality of the results. For example, it is unclear what computer program was used for the transport analysis. Is there a citation for the computer program whether it was an existing program or created just for this application?

The figures illustrating particle-tracking results have some troubling features that are unexplained and suggest problems with the implementation. For example, figures O-5 through 7 show random concentrations in cells surrounding the main plume. We suspect they are noise in the method, or result from not using enough particles. Figures like O-17 that show the 2005 Tc-99 plume beneath most of the Hanford Site are simply mysterious.

The phrase "a close order of magnitude" is used to describe the transport calibration results. If simulation results for the few decades between 1980 and 2003 were within a "close order of magnitude," what is to be expected for the 10,000-year simulation results? Are four orders of magnitude appropriate? Why was so much effort spent on exploring the uncertainty of the flow field, while the transport uncertainty is described in largely qualitative terms?

Overall, the transport simulations likely have some value in illustrating differences in relative groundwater contamination that may result from alternative management scenarios. However, the results presented do not indicate that they should be interpreted quantitatively, and even the order of magnitude of likely error in the long-term simulation results is unknown. Specific comments include the following:

(1) Tables O-6 through O-59 show maximum COPC concentrations for alternatives—For decision making, it helps to know the duration of the COPC exceedance at a receptor; was there one sharp concentration peak that persisted for a few years, or was there a lower peak concentration that was sustained for many millennia? Consider showing the entire time period during which COPC concentrations exceeded the benchmark concentrations at the locations specified and shown on tables. It appears this has essentially been done with regard to risk (if we understand figures like S-18 correctly), but it would be useful for the concentration data also.

(2) Page O-1, final sentence – Flux has the units of mass/time. Curies and grams are not units of flux.

(3) Page O-5, Section O.2—Sensitivity of the model to tritium transport is not a robust test of the transport capabilities of the model for analytes that potentially sorb or react because tritium in groundwater does not sorb or react with aquifer sediments. Thus, the sensitivity of the model to changes in parameters related to uranium or carbon tetrachloride

transport, for example, are not reflected in the analysis of the tritium transport simulations.

(4) Page O-31, Section O-2 Final Conclusions: Due to different map scales and concentration scales, it is extremely difficult to compare the plumes in Fig. O-3 and O-4 to Fig. O-5 and O-10 in a meaningful way. There is also no discussion or comparison of what other parameter set results were like. Tables O-2 and O-3 are not useful and should be replaced with a simplified 1-page table that describes the calibrations ranges. A general discussion of the calibration findings should be added. In addition, the parenthetical phrase at the end of the second bullet highlights the shortcomings of an approach that does not reflect ongoing remediation. This suggests that once the expanded 200 ZP-1 pump and treat system is operational, simulated flow and transport to the north will be entirely unrealistic.

(5) Page O-31, Section O-3—The tables of results are sometimes difficult to understand. For example, we compared peak tritium values from Table O-6 to Tables O-12, -15, and -18. All peaks were simulated to occur prior to the year 2000. The peak tritium values for alternative 1 were slightly different than those in all the other tables. Granted the differences were not large, but why were they different at all? Related to this, it is unrealistic to report these peak concentration values using 8 significant digits. Two significant digits would be adequate for comparison to other alternatives.

(6) Figures O-11 through O-12—Unless we do not understand these figures correctly, the simulated chromium plume is in no way comparable to the observed plumes shown in Fig. S-6 of "Hanford Site Groundwater Monitoring for Fiscal Year 2005" report. Likewise, for the I-129 and Tc-99 maps.

(7) Section O.6.3, K_d sensitivity—It is unrealistic to assume uniform K_d values are applicable to the entire site. It is often the variation in K_d values between different types of sediments that leads to substantially different transport times and peak concentrations. Page U-10 states that a K_d of 0.6 was used for uranium. Uranium has been studied extensively at Hanford, especially in the past few years regarding the mobility, and the conclusion is consistent with non-Hanford studies. The conclusion is that uranium does not behave with a single K_d. The fact that this value of 0.6 was set forth in the DOE 2005 Technical Guidance Document for this EIS does not mean that it is the correct number. There are other modeling results presented in this EIS which are different than the collective conclusion of many other specific technical studies done at Hanford, such as future plutonium concentrations in groundwater at the Columbia River. When faced with the decision to use the modeling parameters in the DOE 2005 Guidance Document vs. the best available technical and scientific information, DOE should use the latter and explain use of alternative sources of information. As discussed in our April meeting, the final EIS should include more clarifying information on selection of model parameters, such as K_d and infiltration rates, and associated uncertainties.

(8) Page U-10 states "Uranium-238 and total uranium simulation results show higher impacts resulting from large discharge facilities in the 200-East Area (e.g., B Pond) than actually observed." This page also states "the prediction of the uranium-238 and total uranium contaminant plumes for large non-*TC & WM EIS* sources should be considered an overestimate of the actual impacts by about an order of magnitude." This paragraph,

which discusses the model results, should provide a specific reference to the model calibration discussion wherein should reside an explanation for why this order of magnitude error in the model was deemed acceptable rather than refining the model to better match actual data. The final EIS should include more clarifying information on uranium simulation, calibration, and predicted impacts to reflect on site experiences with uranium contamination and related impacts.

(9) Page O-112, third paragraph—Although uncertainty in many aspects of the flow and transport modeling was recognized and analyzed with various degrees of quantification, an "accurate assessment of uncertainty in the model" results for even the short-term was not quantified. All that can be said is that there is "a lot" of uncertainty.

Models used in the DEIS analysis are complex and associated with large degrees of uncertainties, particularly about how waste moves in the vadose zone and interact with groundwater (p. S-96). For example, Fig. 2-91 shows human health risk from drinking groundwater under Alternative 6B (Option Cases), but it is not clear how much of the future risk presented in the figure is the result of contamination already in the groundwater vs. how much risk would be expected from continued contaminant loading to the vadose zone by the proposed actions. Impacts resulting from residual waste left in place are also not considered in Fig. 2-91. That process is seen throughout the EIS volumes. Pages R-22 to R-23 state that cleanup and protection of groundwater are among current and future DOE activities at Hanford, but results for all alternatives analyzed in the DEIS (Chapter 5) consistently show a failure to protect groundwater.

Secondary Waste

The DEIS indicates that secondary waste would be waste that is generated from other activities, e.g., waste retrieval or waste treatment, that is not further treated by the WTP or supplemental treatment facilities, and includes liquid and solid wastes (p. S-89). Secondary waste can also be characterized as low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, or hazardous waste.

Under the Preferred Waste Management Alternative, secondary waste from proposed actions would be disposed of in IDF-East only, supplemented by disposal at the River Protection Project Disposal Facility (RPPDF) (Table 5-75). As a result, the waste disposed of in these two facilities would become available for release to the environment. Groundwater transport results show that waste disposals that include secondary waste would cause significant exceedances of groundwater quality standards for I-129 (1 pCi/L) and Tc-99 (900 pCi/L) at the core zone boundary and Columbia River nearshore (Table O-36 through 47). Exceedances for I-129 would range from 7.4-14.5 pCi/L at the core zone boundary and 4.6-7.2 pCi/L at the Columbia River nearshore. Those for Tc-99 would range from 238-23,882 pCi/L at the core zone boundary and 786-6,708 pCi/L at the Columbia River nearshore.

We are also concerned that while release of radionuclides from an immobilized low activity waste (ILAW) glass disposed in landfills would be relatively low, the major release impact of the ILAW treatment would be associated with secondary wastes, including the release of I-129 (p. S-90). It is also possible that secondary waste from supplemental technologies, such as steam reforming and cast stone, would contribute substantial releases of I-129 and Tc-99 to the environment. Modeling results presented in Tables 5-77 through 88 indicate that because of steam reforming supplemental technology, for example, maximum COPC concentrations in the peak year would exceed the standards for Tc-99 by as much as 30,100 pCi/L at the IDF, 24,800 pCi/L at the core zone boundary, and 7,610 pCi/L at the Columbia River nearshore. For I-129, corresponding exceedances would be 24 pCi/L at the IDF, 16 pCi/L at the core zone boundary, and 8 pCi/L at the Columbia River nearshore.

Recommendation:

- *We recommend that the final EIS include a discussion of treatment methods to reduce the amount of COPCs, especially Tc-99 and I-129, in secondary waste and to stabilize the remaining waste such that contaminants would be resistant to leaching.*

Tribes

Information in the DEIS indicates that conditions on the Hanford Site affect resources important to the Wanapum Tribe, Confederated Tribes and Bands of the Yakama Nation (or YN), Nez Perce Tribe, Confederated Tribes of Umatilla Indian Reservation (or CTUIR), and to some extent the Confederated Tribes of the Colville Reservation upstream, particularly groundwater and surface water quality, fisheries, and on-site cumulative risks. While we note that DOE communicated with the Tribes, it is not clear, how the issues raised by the tribes were resolved. Of great concern to most affected tribes is the radiological exposure scenario used in analyzing tribal health risk assessment and DOE's assumption of Hanford site ownership that affected tribes consider too long for their restricted site use.

Some of the Tribes, such as the YN and CTUIR have developed exposure scenarios for risk assessments for use at Hanford that DOE agreed to use. Their scenarios reflect tribal natural resource usage patterns, including fish consumption as well as on-site traditional activities. Because DOE's current land use plan is a flexible short-term plan, and longer-term use is unpredictable, the risk assessment in the DEIS should use an appropriate tribal exposure scenario as one of the reasonably foreseeable land uses and analysis scenarios. Even if future site land uses remain unclear, tribal scenarios could provide information that the tribes need. The CTUIR, for example, believes that the scenario that DOE developed underestimates tribal risks roughly 10-fold because the scenario does not reflect actual tribal site usage patterns.

The DEIS indicates that because of proposed actions, serious long-term impacts to aquatic biota/salmonids would occur due to potential contaminant releases to groundwater on aquatic and riparian resources at the Columbia River (Table 5-172). That impact would be about 21-22 times above the standards for, for example, chromium. During the year of peak dose, this receptor would receive a radiological dose of 3.4 rem and a Hazard Index greater than 1, all of which would be in excess of regulatory limits and chemical exposures. Tribes believe that the radiological risk evaluation by DOE underestimates tribal exposure to radionuclides. For example, the CTUIR consider estimated risks to be about 10 times less than they would be if the tribe's exposure scenario was used. Their scenario can be found online at www.hhs.oregonstate.edu/ph/tribal-grant-main-page.

Consistent with the National Defense Authorization Act that required DOE to develop a future land use plan for at least the next 50 years, DOE completed the Hanford Comprehensive Land Use Plan EIS in 1999 (p. 3-7). With proposed actions, however, tribes are concerned that DOE would extend that initial site control period of 50 years to 10,000 years i.e., through year 11940 (pages 5-3, 5-2, S-57) or indefinitely (p. Q-31). Tribes want the Site use restriction lifted sooner rather than late after cleanup is complete and assurance of safe use.

Recommendation:

- *We recommend that the final EIS should include a discussion on how issues raised by the Tribes during consultations with DOE were addressed, especially regarding impacts to water resources – quantity and quality, land use and radiological exposure. Please note that some of the affected Tribes have developed plans for their own water quality standards and radiological exposure risk scenarios that may be relevant when addressing impacts to their water resources and subsequent human health impacts. As an example, EPA recently approved new water quality standards for the CTUIR that changed their fish consumption rate of 6.5 grams/day to 389 grams/day. The tribal radiological exposure scenario used in the DEIS should therefore be revised to reflect the new 389 grams/day fish consumption rate. Under separate correspondence, we are sending you a copy of these EPA-approved water quality standards.*

Land Use

Section R.3 discusses historical use of the Hanford site. Notable are tribal residential and seasonal use and non-tribal uses, including residential, agricultural, commercial, industrial, and wildlife protection areas. In contrast to the reality of historical actual land uses at Hanford site and uses the site has and can successfully support, section R.4 discusses future land use at Hanford site as constrained by DOE's current Comprehensive Land-Use Plan (CLUP), which does not consider reasonably anticipated future land uses.

Recommendation:

- *The final EIS should revise wording in the document (e.g. on page Q-31) so that it does not assume that DOE will retain long term or permanent control of the site.*
- *Because the DEIS states that implementation of proposed actions would comply with both CERCLA and RCRA requirements (Appendix R, p. 6), we recommend that the final EIS discuss future land uses at Hanford site using EPA Guidance on Land Use in the CERCLA Remedy Selection Process and Reuse Assessments: A Tool to Implement the Superfund Land Use Directive (http://www.epa.gov/superfund/policy/remedy/sfremedy/landuse.htm). Unlike the CLUP, CERCLA cleanup and subsequent land use decisions consider both past and reasonably anticipated future land uses the Hanford site could support. We believe that such uses should be consistent under both programs – CERCLA and CLUP. One important difference between the two programs is that the DEIS currently assumes that DOE would control the site indefinitely, whereas the CERCLA program would not.*

Human Health Risk Analysis

(1) Radiological exposure risk analysis

Figure 2-91 presents human risk from drinking groundwater under alternative 6B (Option Case), wherein all SSTs are clean closed as defined by the DEIS, as are the six sets of cribs and trenches. It might be assumed that under these actions, groundwater loading from residual contamination in the soil left behind would be minimal (i.e. "protective of human health"). It would be informative to the DEIS reader to add a risk reduction curve for existing groundwater inventory with no future vadose loading. This new figure would provide perspective of how the alternatives impact groundwater over time vs. residual risk in the groundwater not resulting from the EIS scope alternatives. Otherwise, the reader cannot tell how much of the future risk presented in Figure 2-91 (and other future risk figures) is the result of contamination already in the groundwater vs. how much risk is the result of continued loading from the vadose zone because of different EIS alternative actions.

Section K.1.1.1.4 discusses radiation protection guides. Most of what is presented, however, is non-enforceable (guidance, recommendations). Only a few of the regulations are mentioned, and none of the laws. This section should be expanded to be consistent with Table 8.1 that lists potentially applicable legal and other requirements. Please note that the CERCLA cancer risk range of 1 in 10,000 to 1 in 1,000,000 would be more stringent than the 100 mrem/year standard used in this DEIS, which is missing from Table K-1. The 100 mrem/year dose limit used in this EIS for the 70-year exposure scenarios would be a lifetime cancer incidence risk of nearly 7 in 1,000, which is much worse than the acceptable CERCLA risk range. EPA has recommended not using dose based recommendations for CERCLA cleanup levels because of the inconsistency with risk based cleanups (see "Radiation Risk Assessment at CERCLA Sites: Q&A" at http://www.epa.gov/superfund/health/contaminants/radiation/pdfs/riskqa.pdf). *EPA therefore recommends DOE use the CERCLA cancer risk range and update the discussion in the final EIS accordingly.*

Section 6.4.2 describes one of the receptor scenarios as a resident farmer. The DEIS explains that the scenario assumes that the garden and crops provide about 25% of the resident farmer's crop and animal product needs. That scenario is different from scenarios used in CERCLA decision documents for the river corridor. The Washington State Model Toxics Control Act (MTCA) B (residential) cleanup regulations do not have any consumption of produce from the site, but do have an exposure duration of 6 years (WAC 173-340-740 equations 740-4 and 740-5). The CERCLA cleanup process considers other applicable or relevant and appropriate requirements including those from the state and thus MTCA provided residential cleanup standards for chemicals have been used for the non-radionuclide cleanup levels in Hanford CERCLA documents. For radionuclides, which aren't covered by MTCA, the CERCLA cleanups have used a rural residential farmer / unrestricted exposure scenario in which 100% of the resident's food is grown on-site and the exposure duration is 70 years ("Remedial Design Report / Remedial Action Work Plan for the 100 Area", DOE/RL-96-17, Revision 6, dated October 2009, table B-8; and Remedial Design Report / Remedial Action Work Plan for the 300 Area", DOE/RL-2001-47, Revision 3, dated December 2009, table B-8b). *EPA* *recommends DOE consult these and other documents and compare the resident farmer scenario used in the DEIS to the rural residential farmer and the MTCA residential cleanup scenarios found in Hanford CERCLA RODs; note differences between scenarios; highlight the scenario with lowest cancer risk; and update the final EIS with any new information reflecting the scenario that would be more protective of human health.*

Under Section 6.4.2.1, the DEIS discusses potential human health impacts. The dose to risk calculation should be checked for accuracy, and explained. The DEIS states that for the period prior to CY 2000, lifetime radiological risks for the year of peak risk at the core zone boundary and Columbia River locations were high, approaching unity. For the period after calendar year 2000, risks remain high, with values between 1×10^{-3} and 1×10^{-2}. The estimated off-site population dose of 215 person-rem per year for the year of peak dose is about 0.01 percent of the average background dose for the population. The EIS doesn't state what the risk numbers 1×10^{-3} and 1×10^{-2} refer to. The reader may guess these refer to lifetime incremental cancer risk, which is a common expression of the principal risk from radionuclides, namely the probability of cancer. The EIS provides a comparison to background, but doesn't explain what background value is used. At the time the DEIS was started, average background radiation dose for the population was generally considered to be about 0.360 rem/year. Converting background radiation to risk, 0.360 rem/year, for a 70 year exposure scenario, times 0.0008 cancer incidence per rem, equals $2\text{x}10^{-2}$ (two in 100) lifetime incremental cancer risk due to background radiation for the 70 year exposure scenarios in this EIS. The figure from the DEIS, 0.01 percent of the background (which was just calculated to be about 2 in 100), would give an incremental cancer risk increase of $2\text{x}10^{-6}$ which clearly is not between 1×10^{-3} and 1×10^{-2} as stated in the DEIS. Please note that, due to due to increased medical exposures, the new National Council on Radiation Protection (NCRP) and Measurements Report 160 (http://www.ncrponline.org/Publications/160press.html) has updated the background radiation dose to be 0.62 rem/year. *The final EIS risk calculations should therefore be checked for accuracy and be updated with the new NCRP background dose.*

Under section 6.4.2.1, the DEIS states that for the period after calendar year 2000, risks remain high, with values between 1×10^{-3} and 1×10^{-2} and that the estimated offsite population dose of 215 person-rem per year for the year of peak dose is approximately 0.01 percent of the average background dose for the population. It was not clear how the risk range was determined, and the peak year dose gives a false estimate that the high risks are only 0.01 percent of the average background dose for the population. *The final EIS should explain how the risk range and related peak dose were obtained.*

Incremental health risk is the increased risk that a receptor (normally a human being living nearby) will face from (the lack of) a remediation project. The use of incremental health risk is based on carcinogenic and other effects and often involves value judgments about the acceptable projected rate of increase in cancer. In some jurisdictions, this is 1 in 1,000,000 but in others, the acceptable projected rate of increase is 1 in 100,000. A relatively small incremental health risk from a single project is not of much comfort if the area already has a relatively high health risk from other operations like incinerators or other emissions, or if other projects exist at the same time causing a greater cumulative risk or an unacceptably high total risk.

When explaining MEI, it is said "this person is assumed to be exposed to radionuclides in the air and on the ground from Hanford emissions, ingest locally grown food irrigated with water from the Columbia River downstream from Hanford, ingest fish from the Columbia River, and use the river for recreation." This statement is true, but excludes consumption of dairy products (p. 3-88, 89). *Because of their influence on risk of exposure to Iodine isotopes, we recommend that dairy products be included in exposure risk calculations.*

At what temperature will the waste be when retrieved from tanks? If the temperature of the waste will be above 100° C, then all radionuclides in tank waste should be considered gases in accordance with the Clean Air Act (see 40 CFR 61, Subpart H-Appendix D). If that was overlooked, *we recommend that the final EIS verify whether air emissions resulting from radionuclide gases would generate doses that could exceed regulatory limits.*

Over the life of the project, there will be an annual average dose of 0.13 mrem (p. 4-132). If all of it were air emissions from 200 Area activities and vented with one stack, this would be considered a major stack for rad emission and will be subject to continuous monitoring. *We recommend that the final EIS include a brief description of sampling and monitoring plans for air emission units that could be present on site during implementation of proposed actions.*

Some dose assessment data presented in Section 5.1 show expected doses that are much higher than the average annual dose (360 mrem/year) for a regular citizen. *The final EIS needs to clarify whether calculated doses are ALARA (as low as reasonably achievable) or not, and measures that will be taken to lower higher doses for the receptors.*

Tables 5-10 through 5-15 show that expected doses at peak year are generally three or four times higher for Native Americans compared to another individual near the site. *The final EIS should include the rationale used in developing the module for Native Americans and reasons for high doses in their dose assessment. Also, please note that cumulative doses are missing for all members and they should be included in the final EIS.*

Iodine-129 is a gas when emitted from the tanks. DOE claimed in p. K-25 that "a second screening analysis was done that assumed that the air treatment system removed 99% of the I-129." For purposes of estimating air emissions, all gaseous radionuclides are released in their entirety or 100%. By assuming 99% removal rate, DOE may have significantly under-estimated doses from I-129. *The final EIS needs to review the list of radionuclides considered to be gaseous under the Clean Air Act and ensure that assumptions used are accurate, and explain which air treatment systems would be used to achieve such high I-129 removal efficiency.*

Section K.2.1.1.4 describes the approach used in determining annual emissions i.e., using an annual average and indicates that the method can result in the peak impact spanning a number of years rather than occurring in a single year. We are concerned that that approach may not be realistic since it would not give the worst case scenario for resultant doses. It is also not possible to know whether doses would exceed regulatory limits or not. *The final EIS should address these issues and demonstrate that the doses would not exceed acceptable limits because of proposed actions.*

Table Q-9 listed an indoor dust filtration factor of 1. Since normal HEPA filter efficiencies range from 99 - 99.5%, *the final EIS should indicate which filters were used and how they were able to filter all contaminants from the air.*

Much of the risk discussion in Chapter 5 and Appendix U is provided as unitless measures of risk. Other than the Hazard Index, which is unitless, but has meaning relative to a value of 1, the remaining risk numbers appear meaningless to the EIS reader and cleanup decision-makers. *The final EIS should include appropriate risk measure units; risk calculations that are a "lifetime incremental cancer risk" should be so marked, and other risk numbers should be appropriately labeled.*

(2) Air quality impacts

For better protection of public health from air pollution exposure, EPA has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants or criteria pollutants (see http://www.epa.gov/air/criteria.html) that should be used to determine if emissions from a project would exceed daily and annual standards. Any projects that would generate emissions exceeding the standards would have to include measures to demonstrate that, if implemented, the project would comply with both state and federal air quality regulations.

Even though background concentrations of criteria pollutants at Hanford are currently below the standards (Table 3-3), it is likely that emissions within the project area could exceed the standards because of proposed actions. As the DEIS noted, particulate matter (PM) concentrations in eastern Washington can change suddenly and reach higher levels due to extreme natural events such as dust storms and large brush fires. On a windy day in 2005, for example, monitoring values for PM_{10} exceeded the 24-hour standard (p. 3-26). Air quality may also be impacted due to management of radioactive waste, dust from road construction and site operations, quarrying, regular traffic on dirt roads, emissions from vehicles, and cumulative impacts from surrounding activities such as agriculture and fire. Of particular concern is the consistent detection of some radionuclides (strontium-90, I-129, cesium-137, plutonium (238, 239, 240, and 241), americium-241, and uranium-235) in air samples collected from the project area in 2006 (Table 3-5). Since data for other radionuclide emissions are missing from the table, it is not possible to determine the level of impacts that would be associated with their emissions.

Results of air quality modeling for the proposed actions indicate potential exceedances of NAAQS for the PM_{10} (24-hour) and carbon monoxide (1-hour) under most Tank Closure and Waste Management alternatives as shown in Tables 4-3 and 4-129, respectively. Under Tank Closure, Alternatives 2A, 3A-C, and 5 would result in incremental criteria pollution concentrations for carbon monoxide ranging from 600-17,700 $\mu g/m^3$ above the standard (40,000 $\mu g/m^3$), and these exceedances could occur over as many as 7 years under each of the alternatives. All Tank Closure Alternatives would result in exceedances of the 24-hour PM_{10} standard, with emissions over the standard (150 $\mu g/m^3$) ranging from 396 (No Action) to 4,960 $\mu g/m^3$ (Alternative 6B). These exceedances could occur over 3 years (No Action) to as many as 192 years under Alternative 6A. Although concentrations of $PM_{2.5}$ were not included in the DEIS, they could also occur at levels higher than the standards during the project life.

Under the Preferred Alternative for Waste Management action, incremental criteria pollution concentrations for carbon monoxide (1-hour) would exceed the standard by as much as 49,800-257,000 $\mu g/m^3$ and for 8-hour carbon monoxide by as much as 41,200 $\mu g/m^3$ (Table 4-129). Similarly, activities under Alternative 3 would also generate emissions of CO with concentrations exceeding the standards for CO (8-hour) by 41,000 $\mu g/m^3$ (disposal group 2 and 3) and for CO (1-hour) by 51,200 (disposal group 1) to 256,000 $\mu g/m^3$ (disposal groups 2 and 3), respectively. These exceedances would also last a very long time covered by the project. Although not provided in the DEIS, concentrations of $PM_{2.5}$ could also occur at levels significantly higher than the standard during the project life.

Mitigation measures, such as construction of a tent-like building over a portion of a tank farm during tank retrieval could provide protection to make closure less environmentally risky. Enclosures provide multiple benefits, such as containment of air releases (protection to adjacent workers, the public, and the environment to reduce short-term impacts) and environmentally sheltered work space for workers (which supports year-round work to reduce inclement weather shutdowns which saves on costs and schedule). The DEIS states that containment structures are impractical due to "a large degree of uncertainty concerning the feasibility" (p. S-56). However, we note that containment buildings are commercially available and being used successfully elsewhere, including by DOE at other sites. As a specific example, the so-called ARP IV enclosure over pit 5 at the Idaho National Lab is operational and is 235 x 270 ft. Section 7.1.4 also lists additional mitigation measures to reduce air quality impacts. The mitigation measures are, however, not quantified and discussed in a manner that clarifies the extent to which predicted air quality impacts and associated exceedances of applicable standards, as discussed above and further explained on p. S-103, would be minimized to meet the standards.

Recommendations:

- *Since the project area and surrounding areas may include sensitive populations such as the elderly and children, the final EIS should quantify and describe in sufficient detail measures that will be taken to reduce predicted emissions to assure NAAQS, particularly for PM and carbon monoxide, will be met by the proposed project. It will also be important to monitor air quality and take corrective action if air quality standards are not met. Monitoring strategies should be tailored to local conditions because localized air quality impacts can be substantial, even though area-wide and/or long term monitoring may show compliance with air quality standards.*
- *The DEIS document should include separate concentrations for PM_{10} and $PM_{2.5}$ because each measure may exceed the standards, while the other might not. As of December 18, 2006, EPA promulgated the revised $PM_{2.5}$ NAAQS to protect the public from short-term fine particle exposure. Thus, the revised NAAQS for $PM_{2.5}$ should be used to help determine the significance of proposed actions' air quality impacts pursuant to 40 CFR 1508.27(b)(2) and (10), as well as when considering the need for and extent of mitigation, for all proposed actions for which NEPA decision documents, i.e., Record Of Decision (ROD) in this case, have not yet been issued. The final EIS therefore needs to evaluate potential $PM_{2.5}$ emissions that would result from the proposed actions for public review and comment; indicate whether the NAAQS for $PM_{2.5}$ would be exceeded or not; and discuss measures that would be taken to assure NAAQS for $PM_{2.5}$ would be met during implementation of proposed actions.*
- *Because the DEIS does not include refined analysis of emissions utilizing reasonable control technologies and more-detailed construction activities (p. 2-144, 4-34, and 7-10), the final EIS should include that information so accurate air quality impacts and mitigation measures and their effectiveness can be determined.*

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action*

Environmental Impact of the Action

LO – Lack of Objections

The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC – Environmental Concerns

EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO – Environmental Objections

EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU – Environmentally Unsatisfactory

EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 – Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 – Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 – Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.